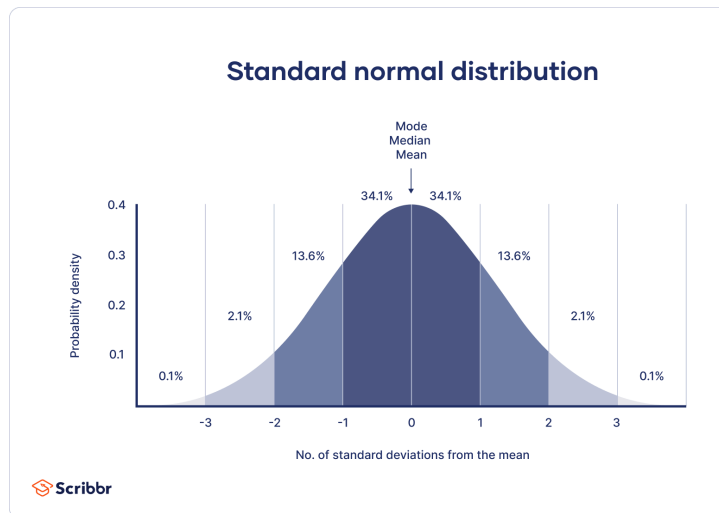


Normal / Gaussian Distribution

In probability theory and statistics, the Normal Distribution, also called the Gaussian Distribution, is the most significant continuous probability distribution for a real-valued random variable. Sometimes it is also called a bell curve.



$$f(x, \mu, \sigma) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$$

Properties of Normal Distribution

- The mean, median and mode are exactly the same.
- The distribution is symmetric about the mean—half the values fall below the mean and half above the mean.
- The distribution can be described by two values: the mean and the standard deviation.

Mean of Normal Distribution

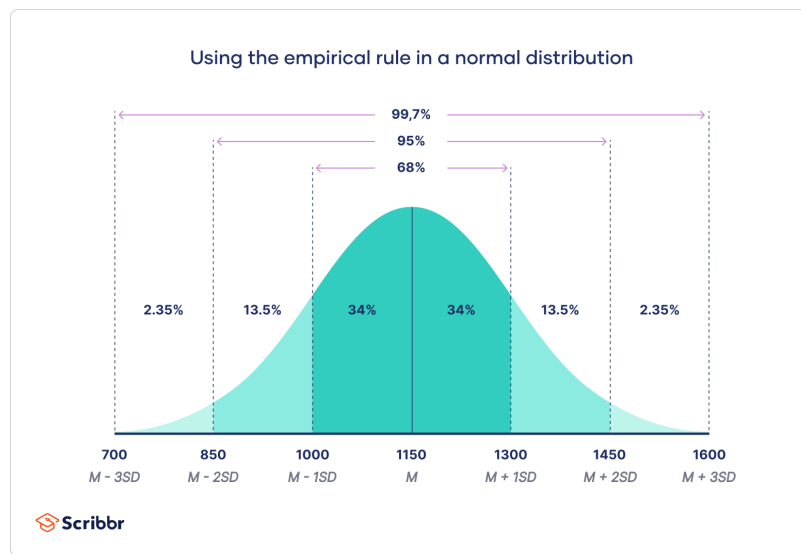
$$\mu = \sum_{i=1}^n \frac{X_i}{n}$$

Variance of Normal Distribution

$$\sigma^2 = \sum_{i=1}^n \frac{(X_i - \mu)^2}{n}$$

Empirical Rule

The empirical rule, or the 68-95-99.7 rule, tells you where most of your values lie in a normal distribution:



- Around 68% of values are within 1 standard deviation from the mean.
- Around 95% of values are within 2 standard deviations from the mean.
- Around 99.7% of values are within 3 standard deviations from the mean.

Example

You collect SAT scores from students in a new test preparation course. The data follows a normal distribution with a mean score (M) of 1150 and a standard deviation (SD) of 150.

Following the empirical rule:

- Around 68% of scores are between 1,000 and 1,300, 1 standard deviation above and below the mean.
- Around 95% of scores are between 850 and 1,450, 2 standard deviations above and below the mean.
- Around 99.7% of scores are between 700 and 1,600, 3 standard deviations above and below the mean.